

ACCESSION NR: AT4014064

than such of mineral oils. From the given review it has been concluded that addition of fats to mineral emulsions has only a slight if any improving effect on the lubricating properties; and that emulsions on the basis of fats or their equivalent substitutes are either expensive or are unstable and insufficiently effective. Orig. art. has: 4 tables.

ASSOCIATION: none

SUBMITTED: 00

DATE ACQ: 19Dec64

ENCL: 00

SUB CODE: MM, IE

NO REF SOV: 007

OTHER: 008

Card 3/3

ACCESSION NR: AT4014065

S/3072/63/000/000/0102/0109

AUTHOR: Belosevich, V. K.; Chamin, Yu. A.; Shakhov, V. L.; Soltan, S. G.; Sazanov, M. A.; Chamin, I. A.

TITLE: Investigation of the properties of various complex esters as technological lubricants for the cold rolling of carbon and special steels

SOURCE: Fiz.-khim. zakonornosti deystviya smazok pri obrabotke metallov davleniyem. Moscow, Izd-vo AN SSSR, 1963, 102-109

TOPIC TAGS: lubricant, cold rolling, steel, complex ester, petrolatum, carbon steel, steel rolling

ABSTRACT: The effect of the structure of some synthetic esters upon their effectiveness as lubricants for the cold rolling of 08KP, 33A 1Kh18N9T, and VG98 steel has been investigated. The effectiveness of the lubricant was evaluated on the basis of measurements during several rolling operations with constant adjustment of the rollers. Thus, the distance of the top roller was reduced after each operation to provide constant pressure. There was found to be a direct linear relationship between band thickness and the pressure of the metal on the roller. The

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ACCESSION NR: AT4014065

effectiveness of various tested esters and natural oils is shown in Figure 1 of the Enclosure. Similar curves were obtained for various hydrocarbon lubricants and mixtures of technical petrolatum with the triethyleneglycol esters of the C17-C21 acids. It is concluded that the effectiveness of an ester increases proportionally with the length of the molecule. The type of alcohol and length of its molecule do not affect the lubrication properties of the ester, but do affect the melting point. Branches, chains and cyclic groups decrease the lubrication effectiveness of the esters. The presence of oleic acid in the lubricant increases the antiscratching property of the lubricant. The most effective esters proved to be those from the dibasic alcohols and the synthetic C17-C21 fatty acids containing antiscratching admixtures. The butyl ester of stearic acid was better than palm oil, while the technological properties of the simple hydrocarbons were worse than those of palm oil. The friction coefficient of any lubricant may be increased by dilution with a less effective one. "The work was carried out under the direction of I. M. Pavlov, corr. member of the AN SSSR." Orig. art. has: 6 figures, and 2 tables.

Card

2/4

ACCESSION NR: AT4014065

ASSOCIATION: None

SUBMITTED: 00

SUB CODE: MM

DATE ACQ: 19Dec63

ENCL: 01

NO REF SOV: 007

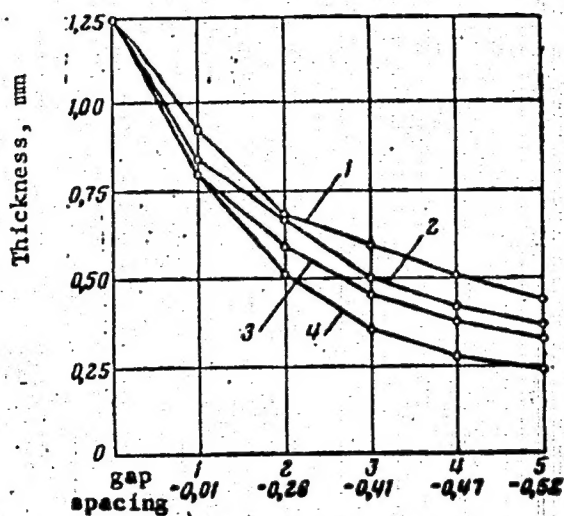
OTHER: 001

Card 7/4

ACCESSION NR: AT4014065

ENCLOSURE: 01

Effectiveness of various complex esters and natural fats (steel 08KP):



Card

4/4

87457

S/057/60/030/012/004/011  
B019/B056

26.2311

AUTHORS:

Burtsev, V. A., Stolov, A. M., Shakhov, V. V.

TITLE:

Measurement of the Energy Flux Emitted by Plasma in  
"Al'fa" Research Installation

PERIODICAL:

Zhurnal tekhnicheskoy fiziki, 1960, Vol. 30, No. 12,  
pp. 1415 - 1421

TEXT: For measuring the energy emitted from the walls of the discharge chamber, a spherical black body with a low thermal capacity and an absorption coefficient of nearly unity was used. By means of this black body only measurements of the total energy emission could be made, because its time lag was too great. For measuring the time dependence of the energy fluxes, a plane pickup (bismuth thermocouple) was used. The signals of the two pickups were made visible by an oscilloscope. The measurements showed that the apparatus used here records not only that part of the energy which is introduced into the plasma. It is assumed that by arc discharges a considerable part of energy is liberated by local emissions, and also a loss occurs as a result of oscillations of

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Measurement of the Energy Flux Emitted by  
Plasma in "Al'fa" Research Installation

87457  
S/057/60/030/012/004/011  
B019/B056

the magnetic field of discharge. The recorded energy emission practically begins with a considerable lag relative to the beginning of discharge. The authors thank B. P. Konstantinov for the suggestion to use a black body for the measurements, and they also thank L. M. Andrezen and L. I. Zantova of the chemical laboratory for their help in producing the pickups. There are 7 figures and 4 Soviet references.

ASSOCIATION: Nauchno-issledovatel'skiy institut elektrofizicheskoy apparatury (Scientific Research Institute of Electrophysical Apparatus)

SUBMITTED: July 15, 1960

Card 2/3



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S/057/60/030/012/004/011  
B019/B056

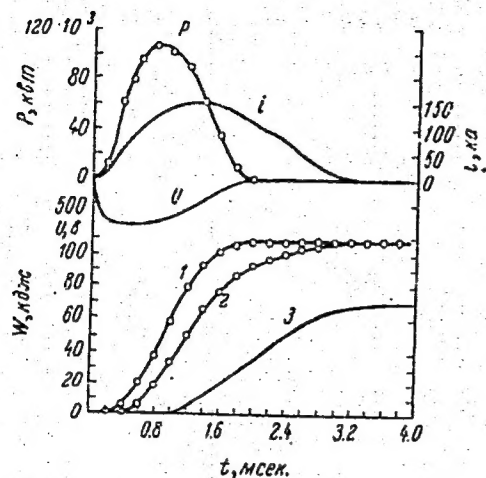


Fig. 7. Уход энергии из плазмы во времени.

Card 3/3



BADAR'YAN, G.G.; TYUTIN, V.A.; CHEREMUSHKIN, S.D.; ZUZIK, D.T.;  
 KHODASEVICH, B.G.; FRAYER, S.V.; GUSAROV, Ye.I.; KAZANSKIY,  
 A.M.; KASSIROV, L.N.; KARAYEV, S.A.; ABRAMOV, V.A.;  
 VASIL'YEV, N.V.; BUGAYEV, N.F.; SAPIL'NIKOV, N.G.; KASTORIN,  
 A.A.; RUDNIKOV, V.N.; YAKOVLEV, V.A.; PEREMYKIN, V.I.;  
 ISAYEV, A.P.; KUZ'MICHEV, N.N.; IL'IN, S.A.; PROMIN, V.A.;  
 LUK'YANOV, A.D.; SHAKHOV, Ya.K.; IL'ICHEV, A.K., kand. sel'-  
 khoz. nauk; KOGAN, A.Ya.; TSYNKOV, M.Yu.; BABIY, L.T.;  
 GORBUNOV, I.I.; KOVALEV, A.M.; ROMANCHENKO, G.R.; BRODSKAYA,  
 M.L., red.; IVANOVA, A.N., red.; GUREVICH, M.M., tekhn. red.;  
 TRUKHINA, O.N., tekhn. red.

[Economics of agriculture] Ekonomika sotsialisticheskogo sel'-  
 skogo khoziaistva; kurs lektsii. Moskva, Sel'khozizdat, 1962.  
 710 p. (MIRA 15:10)

(Agriculture—Economic aspects)

I 30985-66 EWT(m)/EWP(j)/T RPL WW/JW/JWD/WE/GS/RM  
 ACC NR: AT6004591 SOURCE CODE: UR/0000/65/000/000/0166/0172  
 AUTHOR: Il'in, V. K.; Korobova, M. N.; Finyagin, A. P.; Shakhov, Ye. A. 61  
 ORG: none 8+1  
 TITLE: Combustion of fuels containing organic phosphorus compounds  
 SOURCE: AN SSSR. Institut goryuchikh iskopayemykh. Novyye metody szhiganiya topliv i voprosy teorii goreniiya (New methods in the combustion of fuels and problems in the theory of combustion). Moscow, Izd-vo Nauka, 1965, 166-172  
 TOPIC TAGS: combustion, phosphorus, phosphorus compound  
 ABSTRACT: The conditions were studied under which the combustion of a hydrocarbon fuel containing an organic phosphorus compound yields a maximum of  $P_4O_{10}$ . The experiments were conducted by analyzing the combustion products obtained with a hydrocarbon fuel containing either 9 or 30% phosphoric acid ester. A combustion chamber equipped with a fuel atomizer and a scrubber for the retention of combustion products was used. The experiments showed that the highest yield is obtained at an air excess factor of 1.2—1.5. The thermodynamics of reactions at various temperatures are discussed. The experiments are of interest for the combustion of compounds containing phosphorus and for the new methods used in phosphoric acid production. Orig art. has: 3 figures. [PV]  
 SUB CODE: 21 / SUBM DATE: 09Sep65 / ORIG REF: 004 / OTH REF: 003 / ATD PRESS: 4191  
 Cord 1/1 35

AUTHOR: Sinayskiy, E. G. (Moscow); Shakhov, Ye. M. (Moscow)  
 ORG: none  
 TITLE: Unsteady state diffusion of a magnetic field in a plasma cooled by solid walls  
 SOURCE: AN SSSR. Izvestiya. Mekhanika zhidkosti i gaza, no. 4, 1966, 3-8  
 TOPIC TAGS: plasma diffusion, magnetic field, magnetohydrodynamics  
 ABSTRACT: The aim of the work was an evaluation of the role of heat conductivity in the diffusion process of a magnetic field in a plasma. The analysis starts with a solution of the linear problem in a cylindrical conductor without taking heat conductivity into account. The problem is solved by the method of integral relationships and by the method of the expansion of the unknown functions in a series; the second method serves to evaluate the accuracy of the first. There follows an analysis of the problem of the cooling of a plasma moving in a tube. An evaluation is made of the maximum permissible time of processes where the cooling does not yet affect the plasma moving in the center of the tube. Finally, the article solves the problem of the diffusion of a magnetic field in a plasma cooled by walls. All the investigations were carried out on the assumption that the processes are one dimensional, that is, the diffusional and thermal layers are assumed to be

71  
B

heating  
complex  
and diffusion  
SUB CODE: 201

Card 2/2 eqk

SHAKHOV, Ye. M.

Stefan's problem. Trudy Inst. ist. est. i tekhn. 34:512-526 '60.  
 (MIRA 14:2)

(Heat—Radiation and absorption)

SHAKHOV, Ye.M. (Moskva)

One-dimensional nonstationary heating and melting of a solid body  
moving in gas along its plane surface. Inzh.zhur. 1 no.3:46-59 '61.  
(MIRA 15:2)

(Heat—Transmission)(Boundary layer)

SHAKHOV, Ye.M. (Moskva)

Evaporation of a solid body absorbing radiant energy. Inzh. zhur.  
1 no.4:27-38 '61. (MIRA 15:4)

1. Institut mekhaniki AN SSSR.  
(Evaporation)

SHAEV V, YE. N.

Dissertations defended at the Institute of Mechanics for the academic degree  
of Candidate of Physico-mathematical Sciences: 1962

"Several Single-Dimensional Nonstationary Problems of Thermal Processes and  
Phase Transferrations."

Vestnik Akad Nauk, No. 4, 1963, pp. 119-145

SHAKHOV, Ye.M.

Development of a plane-parallel boundary layer in the vicinity  
of the stagnation point of a blunt body set in motion impulsively.  
Inzh.zhur. 2 no.3:27-35 '62. (MIRA 15:8)

1. Institut mekhaniki AN SSSR.  
(Boundary layer)

CIA-RDP86-00513R001548530013-1

14676  
S/258/62/002/004/006/019  
E191/E535

26.2181

AUTHOR:

TITLE:

Shakhov, Ye.M. (Moscow)  
Time to establish a constant rate of fusion of a semi-  
infinite solid body

PERIODICAL: Inzhenernyy zhurnal, v.2, no.4, 1962, 237-244

TEXT:  
of mass removal (ablation) from the surface of the body. Previous  
analytical and experimental studies of the non-stationary process  
of ablating bodies have shown that the steady-state rate of  
melting becomes established rather slowly. Neglecting the non-  
steady nature of the process leads to substantial errors in  
predicting the rate of fusion and of that part of the heat flow  
which is expended on heating up the structure of the flying object.  
If the heat flow at the boundary of fusion, varies so slowly  
with the instant of the appearance of the melting body, starting  
that its variation during the time interval before the establish-  
ment of a steady rate is insignificant, then the non-stationary  
nature of the process mainly affects the time interval before the  
rate is established and the fusion process can be considered



Time to establish a constant ...

S/258/62/002/004/006/019  
E191/E535

quasi-steady. This case is studied in the present paper. The integral equations of the Stefan problem as formulated by L. I. Rubinshteyn (Dokl. AN SSSR, v.58, no.2, 1947) are used. It is assumed that the fused material is immediately withdrawn. Approximate expressions for the rate of fusion and the rate of heat removal into the body are obtained which are asymptotic solutions of the integral equations for large values of time. An advantage over the method of H. G. Landau (Heat conduction in a melting solid. Quart.Appl.Math., v.VIII, no.1, 1950) is that here the initial conditions are unrestricted and the analytical form of the solution obtained permits a fairly simple assessment of the effects of initial conditions on the time of establishment of the steady state. In the vicinity of the front stagnation point of a blunt body in a high temperature gas flow, when the substance of the body has a pronounced melting point lower than the stagnation temperature, heating occurs until the melting point is reached, which instant is defined as the origin of time. The flow around the body is stationary after fusion has commenced. The solid body is considered semi-infinite and the heat propagation in it is unidimensional. Since three phases are considered,

Card 2/3

Time to establish a constant ...

S/258/62/002/004/006/019  
E191/E535

many boundary conditions have to be fulfilled. The problem is simplified when the two products of viscosity and density and of heat conductivity and density are equal in the gas and the liquid phases and when the liquid layer is very thin. The heat flow is considered stationary and known. The basic equations are formulated and the method of solution is discussed. Graphs are given to determine the duration of the transient period. The response of the fusion rate to a sudden change in the heat flow is analysed. There are 3 figures

ASSOCIATION: Institut mekhaniki AN SSSR (Institute of Mechanics,  
AS USSR)

SUBMITTED: May 10, 1962

Card 3/3

S/0258/64/004/002/0251/0253

ACCESSION NR: AP4037097

AUTHOR: Shakhov, Ye. M. (Moscow)

TITLE: Integral equations for the problem of nonsteady state fusing of vitreous materials

SOURCE: Inzhenernyy zhurnal, v. 4, no. 2, 1964, 251-253

TOPIC TAGS: nonsteady state fusing, vitreous film, nonstationary problem, aerodynamic heating, blunt body, Stefan problem, incompressible fluid, viscous fluid

ABSTRACT: The author makes certain simplifying assumptions in the problem of one-dimensional nonstationary fusing of a vitreous film at the front of a blunt body which is subject to aerodynamic heating. He reduces the system of differential equations for the problem to a system of integral equations which are analogous to those for the classical Stefan problem. The following assumptions are made: the material is an incompressible viscous fluid, the viscosity of which falls sharply with temperature increase. Within the body the viscosity is infinite, the coefficient of heat conductivity is constant, the flow around the body and the flow in the boundary layer are quasistationary. The inertial terms in the equation of

Cord 1/2

ACCESSION NR: AP4037097

quantity of motion for flow of the fluid film are negligible. In the system of coordinates referred to a fixed solid body at infinity, the effect of convective heat transfer on the temperature of the surface and the fusion rate is negligibly small, and the temperature across the fluid film is distributed linearly. Via an asymptotic expansion the author concludes that the fusion rate does not depend on the temperature distribution in the material. He reduces the problem to the solution of the heat equation in a certain region with unknown boundaries whose rate of advancement depends on time and temperature at this boundary and does not depend on the temperature distribution within the body. The temperature distribution is found by computation of integrals. Orig. art. has: 10 formulas.

ASSOCIATION: Institut mekhaniki AN SSSR (Institute of Mechanics, AN SSSR)

SUBMITTED: 25Jul63

DATE ACQ: 05Jun64

ENCL: 00

SUB CODE: ME, MA

NO REF SOV: 002

OTHER: 001

Card 2/2

L 14803-65 FWT(1)/EWP(m)/EWG(v)/FCS(k) Pd-1/Pe-5 SSD(b)/ASD(f)-2/  
SSD/AFWL/AEDC(a)/BSD/ASD(p)-3/AFETR/AFTC(a) WW  
ACCESSION NR: AP4049572 S/0258/64/004/004/0646/0649

AUTHOR: Shakhov, Ye. M. (Moscow)

TITLE: Viscous heat-conducting gas flow in a hypersonic shock wave

SOURCE: Inzhenernyy zhurnal, v. 4, no. 4, 1964, 646-649

TOPIC TAGS: hypersonic flow, shock wave, viscous flow, heat conducting gas, viscosity power law

ABSTRACT: The influence of the Prandtl number and, in particular, viscosity on the structure of a shock wave is analyzed. It is shown that the character of the asymptote near the surface of discontinuity holds for any Prandtl number. Differential equations for continuity, momentum, and energy, are integrated with respect to any parameter of the incident flow, assuming that the Prandtl number is equal to  $3/4$  and that viscosity obeys either the Sutherland Law or a power law with an exponent of  $1/2$ . An expression for a nondimensional-velocity profile with arbitrary parameters of incident flow is established, although temperature, density, and pressure are obtained by using

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L 14803-65

ACCESSION NR: AP4049572

Becker's integral, the equation for the conservation of mass, and an equation of state. The solution obtained makes it possible to not only prove the existence of a limiting solution, but also to determine the character of asymptotic behavior of solutions near the limiting case with infinitely increasing Mach numbers. Velocity profiles are given in graphic form for  $M_1 = \infty$  and  $M = 5$ . Orig. art. has: 1 figure and 17 formulas.

ASSOCIATION: Institut mekhaniki AN SSSR (Institute of Mechanics, AN SSSR)

SUBMITTED: 23Jan64

ENCL: 00

SUB CODE: ME, TD

NO REF SOV: 002

OTHER: 003

ATD PRESS: 3140

Card 2/2

ACCESSION NR: AP4013396

S/0010/51/028/001/0188/0192

AUTHOR: Shakhov, Ye. M. (Moscow)

TITLE: Temperature field in a solid body with nonuniformly heated surface

SOURCE: Prikladnaya matematika i mekhanika, v. 28, no. 1, 1964, 188-192

TOPIC TAGS: temperature field, nonuniform heating, aerodynamic heating, heat propagation, heat flow, critical point, Fourier integral, Fourier Bessel integral, Green's function

ABSTRACT: The author studies aerodynamic heating of a body in a neighborhood of the leading critical point. He considers in particular the problem (plane  $\nu = 1$  and axisymmetric  $\nu = 2$ ) of heating of a semi-infinite body  $y > 0$  with temperature  $T_{\infty}$  everywhere identical initially, with given normal derivative on the boundary

$$\frac{1}{s^2} \frac{\partial T}{\partial s} = \frac{\partial T}{\partial r^2} + \frac{\nu-1}{r} \frac{\partial T}{\partial r} + \frac{\partial T}{\partial y^2} \quad (1)$$

$$s=0, \quad y=\infty, \quad T=T_{\infty}$$

$$y=0, \quad \frac{\partial T}{\partial y} = -T_{\infty} (B + e^{-\nu y}), \quad r=0, \quad \frac{\partial T}{\partial r} = 0$$

Card 1/2



ACCESSION NR: AP4013396

This problem can be considered as a model for describing the process of heat propagation in the front part of a blunt body subjected to aerodynamic heating. The solution is sought in the form of a Fourier integral or a Fourier-Bessel integral. Suppose that a heat front moves with velocity  $V$  along the surface of the body half-space  $y > 0$  in the positive direction along the  $x$  axis. At time  $t = 0$  the front is in the plane  $x = 0$ . The body is divided by heat insulation along the plane  $x = 0$  into two quarter-spaces. The process of propagation in the body is determined in the region  $x > 0, y > 0$ . The solution is obtained with the aid of the Green's function. The author gives some asymptotic results. Orig. art. has: 18 formulas.

ASSOCIATION: none

SUBMITTED: 14Feb63

DATE ACQ: 26Feb64

ENCL: 00

SUB CODE: AI, MM

NO REF SOV: 004

OTHER: 001

Card 2/2

SHIDLOVSKIY, Vsevolod Pavlovich; SPAKHOV, Ye.M., red.

[Introduction to the dynamics of rarefied gas] Vvedenie  
v dinamiku razrezhennogo gaza. Moskva, Nauka, 1965.  
217 p. (MIRA 18:9)

L 00550-66

ACCESSION NR: AP5018820

UR/0354/65/000/007/0058/0060

634.0.362

AUTHOR: Shakhov, Ye. N. (Candidate of agricultural sciences)

TITLE: New mechanism for cutting forest leftovers

SOURCE: Lesnoye khozyaystvo, no. 7, 1965, 58-60

TOPIC TAGS: saw, power saw, woodworking machinery, self propelled saw / SMA 1  
power saw

ABSTRACT: A new self-propelled saw for cutting trees (2-18 cm diameter) or dense growth (4-5 cm diameter) at a level of less than 10 cm above ground was developed at VNIILM. The power saw SMA-1 (see Fig. 1 on the Enclosure) consists of a frame 1, drive 2, engine 3 (from power saw "Druzhba"), worm reducer 4, clutch 6, chain drive 7, speed reducer 5, chain drive 8, clamp 10 (for clamping the sawing beam), guiding bars 11 and 12, pivot 13 (for turning the sawing beam through 90° in either direction), ratchet mechanism 14 and 15, controls 16 and 17, and gas tank 21. Two sawing attachments for cutting trees or dense growth can be used. The specifications of the SMA-1 are: weight 55 kg, fuel tank 1.5 liter, length 730 mm (without saw), width 200 mm at lower frame, 480 at handles, height 1000 mm,

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L 00550-66

ACCESSION NR: AP5018820

speed 2-4 km/hr. After successful initial tests in 1964 the Glavleskhoz of RSFSR plans manufacture of 200 units for field testing. Orig. art. has: 1 figure.

ASSOCIATION: none

SUBMITTED: 00

ENCL: 02

SUB CODE: IE

NO REF SOV: 000

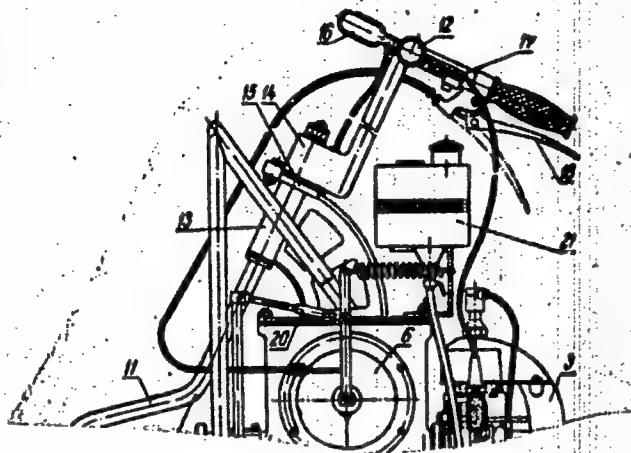
OTHER: 000

Card 2/4

L 00550-66

ACCESSION NR: AP5018820

ENCLOSURE: 01



to card 4/4

Card 3/4

L 00550-66

ACCESSION NR: AP5018820

ENCLOSURE: 02

from card 3/4

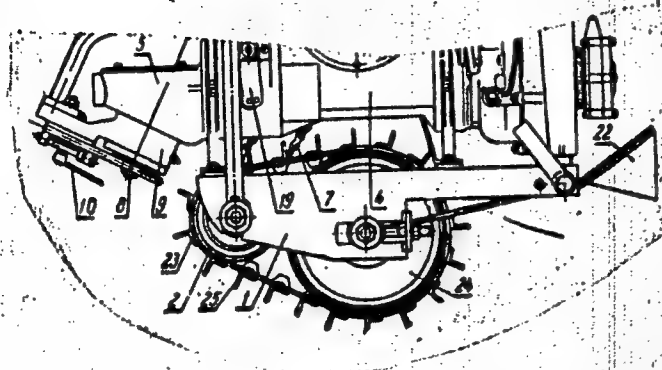


Fig. 1.  
Self-propelled saw SMA-1

Card 4/4

SHAKHOV, Ye. V.; RYZHAKOV, D. I.

Morphological changes in the graft during enteroplasty of the ureter in an experiment. Urologia no.6:47-50 '61. (MIRA 15:4)

1. Iz basseynovoy klinicheskoy bol'nitsy Verkhnevolzhskogo vodzdravotdela i kafedry normal'noy anatomii Gor'kovskogo meditsinskogo instituta imeni S. M. Kirova (nauchnye rukovoditeli: zasluzhennyy deyatel' nauki prof. A. P. Frumkin i zasluzhennyy deyatel' nauki prof. B. A. Korolev)

(INTESTINES--TRANSPLANTATION) (URETERS--SURGERY)



L 12746-63

EWT(d)/FCC(w)/BDS AFFTC

S/208/63/003/002/003/014

IJP(C)  
AUTHOR:

Gorbunov, A. D. (Moscow) and Shakhov, Yu. A. Tbilisi)

TITLE:

An approximate solution of the Cauchy problem for ordinary differential equations with a preassigned number of exact signs. I

PERIODICAL:

<sup>16</sup>  
Zhurnal vychislitel'noy matematiki i matematicheskoy fiziki, v. 3, no. 2, 1963, 239-253

TEXT:

The bilateral difference method by Ronge-Cutt for the approximate solution of the ordinary differential equations allows a simple and exact estimate of errors and is easier than the similar method by Adams since it does not contain the "initial section." The present paper investigates the abovementioned method for the case of first order differential equations with an emphasis on the particularities related to approximate quadratures (the approach follows three steps: the evaluation of the quadratures, Cauchy's problem for one equation, and Cauchy's problem for a system of equations). The authors derive the bilateral methods for the first, second, and third order. Each pair of equations depends on two parameters whose choice specializes the method to suit any particular problem. Using the computer Strela of the Moscow State University Computing Center, the authors numerically calculated tables for the functions (1)  $y' = y$ ,  $y(0) = 1$  with the third order method; (2)  $y' = -y/x$ ,  $y(1) = 1$  with the second order method; (3) the Fresnel

Card 1/2

L 12746-63

S/208/63/003/002/003/014

An approximate solution .....

integral using the third order method with a limiting error of  $6 \cdot 10^{-8}$  and (4)

8.95

$\int_0^8 dx/(1+x)$  with a preassigned accuracy and two exact signs. The authors

thank A. N. Tikhonov and I. S. Berezin for their interest. There are 7 tables.

SUBMITTED: May 19, 1962

Card 2/2

S/0208/64/004/003/0426/0433

ACCESSION NR: AP4037248

AUTHORS: Gorbunov, A. D. (Moscow); Shakhov, Yu. A. (Tiflis)

TITLE: Approximate solution of the Cauchy problem for ordinary differential equations with previously given number of correct signs. 2.

SOURCE: Zhurnal vyshislitel'noy matematiki i matematicheskoy fiziki, v. 4, no. 3, 1964, 426-433

TOPIC TAGS: approximate solution, Cauchy problem, differential equation, correct sign, Runge Kutta method

ABSTRACT: Let  $y(x) = \{y^{(1)}(x), \dots, y^{(N)}(x)\}$  be the desired vector-function, of  $N$  dimensions,  $f(x, y) = \{f^{(1)}(x, y), \dots, f^{(N)}(x, y)\}$  be a given vector-function of  $N + 1$  variables  $x, y^{(1)}, \dots, y^{(N)}$ , continuous and sufficiently smooth in some closed region  $G$  of the space  $\{x, y^{(1)}, \dots, y^{(N)}\}$ ,  $(x_0, y_0) \in G$ . The authors consider the Cauchy problem for the system of differential equations.

$$\frac{dy}{dx} = f(x, y), \quad y(x_0) = y_0. \quad (1)$$

Card 1/2

ACCESSION NR: AP4037248

They describe coordinate-wise two-sided Runge-Kutta methods for approximate solution of (1) and give expressions for the remainder terms in the general case. They prove convergence of the Runge-Kutta methods, study the concept of measure of error of the approximate solution, and derive an effective estimate of the modulus of this measure. The conditions of computation under which the approximate solution is obtained with a given number of correct signs are explained, and some numerical results are given. This paper is a generalization of the authors' previous work (same title, No. I.). "The authors express their deep gratitude to A. N. Tikhonov, I. S. Berezin and D. A. Kveselav for their constant attention to the work." Orig. art. has: 4 tables and 20 formulas.

ASSOCIATION: none

SUBMITTED: 05Jun63

DATE ACQ: 09Jun64

ENCL: 00

SUB CODE: MA

NO REF SOV: 004

OTHER: 000

Card 2/2

SHAKHOV, Yu.A.; NOSKOV, A.A.; ROMANOV, P.G.

Upper boundary of a foaming state on sieve plates. Zhur.  
prikl. khim. 37 no.9:2074-2077 3 '64.

(MIRA 17:10)

SHAKHOV, Yu.D., inzh.; REZNIKOV, D.I., inzh.

Improving techniques and equipment in the production of keramzit.  
Stroi. mat. 8 no.8:28-31 Ag '62. (MIRA 15:9)  
(Keramzit)

GOVBUNOV, A. J. (Moskva); NIKOL' V. YUL' (Ibrishi)

Approximate solution to the Cauchy problem for ordinary  
differential equations with a preassigned number of correct  
signs. Part 2. Izv. vyssh. mat. i mek. fiz. 4 no.3:426-453  
Mg-Je '64. (NLR 17:6)



16(2)

16.6100

SOV/38-23-6-2/11

AUTHOR:

Shakhov, Yu.N.

TITLE:

On the Imitation of Simplest Markov Processes

PERIODICAL:

Izvestiya Akademii nauk SSSR, Seriya matematicheskaya, 1959,  
Vol 23, Nr 6, pp 815-822 (USSR)

ABSTRACT:

Let a homogeneous Markov process with discreet time and  $q$  states be given. The probability  $p_i$  that the particle is in the initial moment in the  $i$ -th state ( $i = 1, 2, \dots, q$ ) and the matrix  $\{p_{ij}\}$  of the transition probabilities are assumed to be known. The probability that for  $n$  experiments the given combination  $\Delta_n = \beta_1 \beta_2 \beta_3 \dots \beta_{n-1} \beta_n$  ( $1 \leq \beta_i \leq q$ ) arises, is  $\mu_{\Delta_n} = p_{\beta_1} p_{\beta_1 \beta_2} p_{\beta_2 \beta_3} \dots p_{\beta_{n-1} \beta_n}$ . Let  $E_n(q)$

be the set of all different numbers of  $n$  ciphers in the  $q$ -adic system. Let  $E'_n(q)$  be the set arising from  $E_n(q)$ , if

every number  $\Delta_n$  is repeated  $l m^{n-1} \mu_{\Delta_n}$  - times, where  $l$  and  $m$  are common denominators of the  $p_i$  and  $p_{ij}$ . Let a normal

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On the Imitation of Simplest Markov Processes

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periodic system be defined according to Korobov [Ref 1].  
Theorem : Normal periodic systems on  $E'_n(q)$  are possible if and only if it is

$$(2) p_1 = \sum_{i=1}^q p_i p_{i1}, p_2 = \sum_{i=1}^q p_i p_{i2}, \dots, p_{q-1} = \sum_{i=1}^q p_i p_{i,q-1}$$

By means of normal periodic for  $E'_n(q)$  the author constructs a normal sequence in the sense of Markov which is different from that given in (3).  
There are 3 Soviet references.

PRESENTED: by I.M. Vinogradov, Academician

SUBMITTED: January 12, 1959

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46(1) 1500  
AUTHOR: Shakhov, Yu. N.

SOV/20-128-6-11/63

TITLE: Approximate Solution of Second Kind Volterra Equation by Means of Iteration

PERIODICAL: Doklady Akademii nauk SSSR, 1959, Vol 128, Nr 6, pp 1136-1139 (USSR)

ABSTRACT: The author considers the equation

$$(1) \quad \varphi(x) = \int_0^x K(x,y)\varphi(y)dy + f(x),$$

where  $\frac{\partial K}{\partial x}$ ,  $\frac{\partial K}{\partial y}$ ,  $\frac{\partial^2 K}{\partial x \partial y}$  are continuous in  $0 < x < 1$ ,  $0 < y < x$  and have finite limit values for an approximation of the arguments to the boundary of the domain;  $\frac{df}{dx}$  is continuous for  $0 < x < 1$ ; there exist

$\lim_{x \rightarrow 0+0} \frac{df}{dx}$  and  $\lim_{x \rightarrow 1-0} \frac{df}{dx}$ .  $K_s(x_1, \dots, x_s)$  is defined in  $0 \leq x_1 \leq x$ ,  $i=1, \dots, s$  as follows: In every domain

$$(2) \quad x \geq x_{h_1} \geq x_{h_2} \geq \dots \geq x_{h_s} \geq 0,$$

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Approximate Solution of Second Kind Volterra  
Equation by Means of Iteration

SOV/20-128-6-11/63

where  $1 \leq h_k \leq s$ ,  $k=1,2,\dots,s$ , and  $h_k \neq h_1$  for  $k \neq 1$ , let

$$(3) \quad K(x_1, \dots, x_s) = K(x, x_{h_1}) \cdot K(x_{h_1}, x_{h_2}) \cdot \dots \cdot K(x_{h_{s-1}}, x_{h_s}) f(x_{h_s})$$

Let  $a_1, a_2, \dots, a_s, \dots$  be optimal coefficients in the sense of [Ref 1],  $N > 3$  and prime,  $n = \lfloor \ln N / 2 \ln \ln N \rfloor$ , where  $\lfloor z \rfloor$  is the number of integral unities in  $z$ .

Theorem: Under the given assumptions it holds

$$(4) \quad \varphi(x) - f(x) - \frac{1}{N} \sum_{k=1}^N \sum_{s=1}^n \frac{x^s}{s!} K_s \left( 2x \left( \frac{ka_1}{N} \right), 2x \left( \frac{ka_2}{N} \right), \dots, 2x \left( \frac{ka_s}{N} \right) \right) =$$

$$= O \left( N^{-\frac{1}{2} + \varepsilon} \right), \quad \varepsilon > 0.$$

The author mentions N.M.Korobov, N.N.Chentsov, and N.S.Bakhvalov. There are 4 Soviet references.

ASSOCIATION: Matematicheskiy institut imeni V.A.Steklova Akademii nauk SSSR  
(Mathematical Institute imeni V.A.Steklov AS USSR)

PRESENTED: June 12, 1959, by I.M.Vinogradov, Academician

SUBMITTED: June 10, 1959

Card 2/2

20630

16.350  
16.6500

S/020/61/136/006/006/024  
C 111/ C 333

AUTHOR: Shakhov, Yu. N.

TITLE: Approximate solution of Volterra's second kind equations by means of iterations

PERIODICAL: Akademiya nauk SSSR. Doklady, v. 136, no. 6, 1961, 1302-1305

TEXT: Let  $D$  be a closed  $s$ -dimensional domain. The function  $F(x_1, \dots, x_s)$  is said to belong to the class  $H_s^\alpha(C)$  on  $D$ , if the derivatives

$\partial^k F(x_1, \dots, x_s) / \partial x_1^{\gamma_1} \dots \partial x_s^{\gamma_s}$ , where  $0 \leq k \leq \alpha$ ,  $0 \leq \gamma_i \leq \alpha$  are continuous for  $(x_1, \dots, x_s) \in D$  and bounded in the absolute value by  $C = \text{const}$ .

Let  $F \in H_s^\alpha$  on the  $s$ -dimensional unit cube. Let a function  $F^*(x_1, \dots, x_s)$  be introduced on  $-1/2 \leq x_1, \dots, x_s \leq 3/2$  so that  $F^* \in H_s^\alpha$  on  $-1/2 \leq x_1, \dots, x_s \leq 3/2$  and  $F^*(x_1, \dots, x_s) \equiv F(x_1, \dots, x_s)$  for  $0 \leq x_1, \dots, x_s \leq 1$ . The function  $\tau(x)$ ,  $0 \leq x \leq 1$ , is assumed to satisfy the conditions:

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C 111/ C 333

Approximate solution . . .

- 1)  $d^k \tau(0) / dx^k = d^k \tau(1) / dx^k = 0, k=0, 1, 2, \dots, \infty - 2;$
- 2)  $\tau(x) \equiv 1$  for  $1/4 \leq x \leq 3/4;$
- 3)  $d^\infty \tau(x) / dx^\infty$  is continuous.

Let  $\tau(x)$  be periodically continued onto the whole axis. Let  $N$  be a prime number,  $N > s$ ;  $a_1, \dots, a_s$  are assumed to be optimum coefficients (see N. M. Korobov (Ref. 4: DAN, 132, No. 5, 1009 (1960))).  
Let

$$\psi_k(x_1, \dots, x_s) = \sum_{\bar{m}_1 \dots \bar{m}_s < \sqrt{N}} \exp \left[ 2\pi i \left( m_1 \left( x_1 - \frac{ka_1}{N} \right) + \dots + m_s \left( x_s - \frac{ka_s}{N} \right) \right) \right].$$

Lemma: If  $F \in H_s^\alpha(C)$  on the  $s$ -dimensional unit cube and  $\alpha > 1$ , then it holds the estimation

$$\left| F(x_1, \dots, x_s) - \frac{1}{N} \sum_{k=1}^N \tau\left(\frac{ka_1}{N}\right) \dots \tau\left(\frac{ka_s}{N}\right) \psi_k\left(\frac{x_1}{2} + \frac{1}{4}, \dots, \frac{x_s}{2} + \frac{1}{4}\right) \right| \times$$

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Approximate solution . . .

$$\times F^{\pm} \left( 2 \left\{ \frac{ka_1}{N} \right\} - \frac{1}{2}, \dots, 2 \left\{ \frac{ka_s}{N} \right\} - \frac{1}{2} \right) \leq \frac{CC_1}{N^{\frac{\alpha-1}{2}} - \varepsilon},$$

for every  $\varepsilon > 0$ , where  $C_1 = \text{const}$  does not depend on  $\alpha$  and  $\varepsilon$ ,  
and  $\{z\}$  denotes the integer part of  $z$ .

The author considers the equation

$$\varphi(x) = \int_0^1 K(x,y) \varphi(y) dy + f(x) \quad (2)$$

Let on the unit square be  $K \in H_2^{\alpha}$  and on the unit interval  
 $f \in H_1^{\alpha}$ , where  $\alpha > 1$ . Let denote

$$A_{k,s} = \tau \left( \frac{ka_1}{N} \right) \dots \tau \left( \frac{ka_s}{N} \right) \sum_{\bar{m}_1 \dots \bar{m}_s < \sqrt{N}} \exp \left[ 2\pi i \left( m_1 \left( \frac{1}{4} - \frac{ka_1}{N} \right) + \dots \right. \right. \\ \left. \left. \dots + m_s \left( \frac{1}{4} - \frac{ka_s}{N} \right) \right) \right] \times \left[ \pi i (m_1 + \dots + m_s) \pi i (m_1 + \dots + m_{s-1}), \dots, \right. \\ \left. \pi i m_1, 0 \right]$$

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S/020/61/136/006/006/024  
C 111/ C 333

Approximate solution . . .

where  $[y_0, \dots, y_s]$  is the split difference of order  $s$  of the function  $\varphi(y) = \varphi_{s,yx}$  with respect to the points  $y_0, y_s$ .

Theorem: If  $K(x, y)$  and  $f(x)$  satisfy the given differentiability conditions, if  $a_1, \dots, a_s$  are optimum coefficients,  $N > \alpha_2$  - - prime number and  $n = \lfloor (\alpha_2 - 1) \ln N / 2 \ln \ln N \rfloor$ , then for every  $\varepsilon > 0$  it holds

$$\begin{aligned} \varphi(x) - f(x) - \frac{1}{N} \sum_{h=1}^N \sum_{\gamma_s=0}^{\alpha_s-2} \dots \sum_{\gamma_1=0}^{\alpha_1-2} A_{h, \gamma_s} \frac{\partial^{\gamma_1+\dots+\gamma_s}}{\partial x_1^{\gamma_1} \dots \partial x_s^{\gamma_s}} \{ \tau(\xi_1^{(h)}) \dots \tau(\xi_s^{(h)}) \} \times \\ \times K^* \left( x, 2 \left( \xi_1^{(h)} \right) - \frac{1}{2}, 2 \left( \xi_2^{(h)} \right) - \frac{1}{2}, 2 \left( \xi_s^{(h)} \right) - \frac{1}{2} \right) \dots \\ \dots K^* \left( 2 \left( \xi_{s-1}^{(h)} \right) - \frac{1}{2}, 2 \left( \xi_s^{(h)} \right) - \frac{1}{2} \right) f^* \left( 2 \left( \xi_s^{(h)} \right) - \frac{1}{2} \right) \} = O(N^{-\alpha_1+\varepsilon}). \end{aligned}$$

where the constant in  $O$  depends on  $\alpha, \varepsilon$  and on the constants which bound the absolute values of the derivatives of the kernel and of the free term.

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S/020/61/136/006/006/024

C 111/ C 333

Approximate solution . . .

V. S. Ryaben'kiv is mentioned in the paper.

There are 5 Soviet-bloc references.

ASSOCIATION: Matematicheskii institut imeni V. A. Steklova  
Akademii nauk SSSR (Institute of Mathematics imeni  
V. A. Steklov of the Academy of Sciences USSR)

PRESENTED: October 8, 1960, by J. M. Vinogradov, Academician

SUBMITTED: October 3, 1960

Card 5/5

SHAKHOV, Yu.N. (Moskva)

Calculating the eigenvalues of an  $n$ -dimensional symmetrical kernel  
with the aid of number-theoretical nets. Zhur. vych. mat i mat fiz.  
3 no.6:988-997 N.D. 63. (MIRA 17:1)

L 04305-67 EWT(1)/FOC GW

ACC NR: AR6014578

SOURCE CODE: UR/0169/65/000/011/DO27/DO27

AUTHORS: Karasik, A. M.; Shakhov, Yu. N.; Shchelovanov, V. G.

TITLE: Field studies of aeromagnetometers AM-13 and AMM-13 ✓

SOURCE: Ref. zh. Geofizika, Abs. 11D188 2<sup>4</sup> 2<sup>5</sup>

REF SOURCE: Sb. Geofiz. priborostr. Vyp. 21. L., Nedra, 1964, 83-100

TOPIC TAGS: aerial survey, magnetometer, magnetic effect / AM-13 magnetometer, AMM-13 magnetometer, PPM magnetometer

ABSTRACT: In the course of aeromagnetic surveying of the northern Arctic Ocean in 1963, dissimilar relative ferrosonde magnetometers were simultaneously mounted in the IL-14 airplane. The magnetometers were AM-13, AMM-13, and the proton-precessional magnetometer PPM. A simultaneous utilization of two aeromagnetometers of the same type served to increase the reliability and accuracy of magnetic field measurements and made it possible to conduct comparative studies of the instrumental errors for the instruments working under identical conditions. A substantial drift of the zero reading in both the AM-13 and the AMM-13 was noted during work conducted under arctic conditions. This was caused mainly by the influence of the temperature. Making an exact allowance for the zero drift of the magnetometers was found possible only with the use of an absolute auxiliary apparatus. A lack of uniformity in the ribbon feed

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UDC: 550.838

L 04305-67

ACC NR: AR6014578

of both the AM-13 and the AMM-13 was also noted. This nonuniformity may be corrected with the help of time markings produced by a chronometer. A. Lozinskaya [Translation of abstract]

SUB CODE: 08

Card

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L 9937-65 EAT(d) Pg 4 IJP(c)/AFNL/ASD(d)/ESD(dp)/RAEM(t) MLK  
 S/0000/64/000/000/0075/0100  
 ACCESSION NR: AT4047139

AUTHOR: Shakhov, Yu. N. (Moscow)

TITLE: An approximate solution to multidimensional linear Volterra equations of the second kind by the method of iteration 16 B

SOURCE: Chislenny\*ye metody\* resheniya differentsial'ny\*kh i integral'ny\*kh uravneniy i kvadrurny\*ye formuly\* (Numerical methods of solving differential and integral equations and quadrature formulas); sbornik statey. Moscow, Izd-vo Nauka, 1964, 75-100

TOPIC TAGS: integral equation, Volterra equation, quadrature, iteration, linear integral equation, multidimensional linear integral equation

ABSTRACT: The present paper considers the following multidimensional Volterra equation of the second kind

$$\varphi(x_1, \dots, x_n) = \int_0^{x_1} dy_1 \int_0^{x_2} dy_2 \int_0^{x_3} \dots \int_0^{x_n} K(x_1, \dots, x_n, y_1, \dots, y_n) \varphi(y_1, \dots, y_n) dy_n + f(x_1, \dots, x_n) \quad (1)$$

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ACCESSION NR: AT4047139

The above solution is approximated by

$$\varphi_n^N(P) = I(P) + \sum_{\alpha=1}^n \sum_{k=1}^N \alpha_k^{(n)} K(P, M_{k,1}) K(M_{k,1}, M_{k,2}) \dots K(M_{k,n-1}, M_{k,n}) I(M_{k,n}) \quad (5)$$

where the  $M_{k,i}$  refer to the variables appearing as limits in the integrals, and the  $\alpha_k^{(n)}$  are derived from a quadrature formula. Representing the first equation above in abbreviated notation

$$\varphi(P) = \int_{\sigma(P)} K(P, Q) \varphi(Q) dQ + I(P), \quad (6)$$

the basis result is to show that

$$\left| \varphi(P) - I(P) - \sum_{\alpha=1}^n \varphi_\alpha(P) \right| < \frac{\sigma_n^{n+1}}{(n+1)!} \quad (7)$$

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ACCESSION NR: AT4047139

for a certain constant  $C_4$ , where the  $\varphi_s(P)$  are in turn approximated by the following sums

$$\left| \sum_{s=1}^n \varphi_s(P) - \frac{1}{\pi} \sum_{k=1}^N \sum_{j=1}^n A_{kj} K^*(P, M_{k,j}) K^*(M_{k,j}, M_{k,j}) \dots \right. \\ \left. \dots K^*(M_{k,j-1}, M_{k,j}) f^*(M_{k,j}) \right| < \frac{C_4}{N^{2-1/n}} \quad (8)$$

The  $A_{kj}$  are determined by a complex quadrature process, giving the optimal coefficients in the above estimate. Orig. art. has: 28 formulas.

ASSOCIATION: none

SUBMITTED: 10Jul63

ENCL: 00

SUB CODE: MA

NO REF SOV: 016

OTHER: 004

Card 5/5

22014-66 EWT(d) IJP(c)

ACCESSION NR: AP5025116

UR/0208/65/005/005/0911/0916

27  
13

AUTHOR: Shakhov, Yu. N. (Moscow)

TITLE: On evaluation of integrals with increasing multiplicity

SOURCE: Zhurnal vychislitel'noy matematiki i matematicheskoy fiziki, v. 5, no. 5, 1965, 911-916

TOPIC TAGS: multiple integral, Lipschitz condition, number theory, *periodic function, integral equation*

ABSTRACT: The author used *16, 44, 55* number-theoretic networks to evaluate multi-dimensional integrals of periodic functions satisfying Lipschitz' multiplicity condition. He considered the case where the dimension of integrals increases together with the increase of the nodes of the quadrature formula, using the method of iteration of integral equations. Various estimations were obtained using essentially the results of S. A. Telyakovskiy. (Some estimations for trigonometric series with quasi-convex coefficients. Matem. sb., 1964, 63(105), No. 3, 426-444.) The author also generalized some of the results of N. M. Korobov. (Number-theoretical methods in the analysis of approximations. M., *1965*, 170 p.) Orig. art. has: 3 formulas.

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ADC: 518:517.392

L 22014-66

ACCESSION NR: AP5025116

ASSOCIATION : none

SUBMITTED: 27Jan65

NO REF SOV: 005

ENCL: 00

SUB CODE: 12

OTHER: 003

Card 2/2 *W*

DRUGAL', S.A., kand.tekhn.nauk; SHAKHOV, Yu.V., inzh.

Selecting the type of hopper locking mechanisms. Vest.TSNII MPS  
20 no.5:59-61 '61. (MIRA 14:8)

1. Ural'skoye otdeleniye Vsesoyuznogo nauchno-issledovatel'skogo  
instituta zheleznodorozhnogo transporta Ministerstva putey  
soobshcheniya, Sverdlovsk.  
(Railroads---Freight cars)

SHAKHOVA, A.A.

137-58-5-9281

Translation from: Referativnyy zhurnal, Metallurgiya, 1958, Nr 5, p 71 (USSR)

AUTHORS: Shakhova, A.A., Yurchenko, A.V.

TITLE: A Study of the Operation of Kommunar Plant Nr. 2 Conducted in Order to Improve its Production Indices (Izucheniye raboty Kommunarovskoy fabriki No 2 s tsel'yu uluchsheniya yeye tekhnologicheskikh pokazateley)

PERIODICAL: Tr. N. -i. gornorazved. in-ta "Nigrizoloto", 1957, Nr 22, pp 162-165

ABSTRACT: Factors responsible for lower production indices were studied and appropriate recommendations are offered. Individual units were studied by means of sampling. Conclusions made as a result of the investigation are presented.

I. D.

1. Industrial plants--USSR

Card 1/1

137-58-4-6493

Translation from: Referativnyy zhurnal, Metallurgiya, 1958, Nr 4, p 9 (USSR)

AUTHORS: Shakhova, A. A. Shinkarenko, N. M.

TITLE: A Study of the Possibility of Flotation of the Ore of Podlunniy  
Golets of the Kommunarovskiy Mine (Izucheniye vozmozhnosti flotatsii)  
rudy Podlunnogo Gol'tsa Kommunarovskogo rudnika)

PERIODICAL: Tr. N. -i. gornorazved. in-ta "Nigrizoloto," 1957, Nr 24,  
pp 126-129

ABSTRACT: Au nuggets were removed by jigging before flotation. The following flotation procedure was established: grinding 95 percent to -100 mesh; reagents consumed (in g/l): xanthate 100, frother 20, pine oil 48; pH 7.0-8.0; soda consumed 0.5 kg/t. Flotation time 15 min. The employment of hydrocyclones in combination with flotation yielded no special effect. When the flotation concentrate was cyanided with prior washing out of the reagents and with a cyanide concentration of up to 0.1 percent, 97.3 percent of the Au was recovered.

A. Sh.

1. Ores--Processes    2. Flotation--Applications

Card 1/1

BARYSHNIKOV, I.F.; CHEVASHEVA, G.I.; SHAKROV, A.<sup>2</sup>

Efficient flow sheets for the processing of gold containing  
concentrates and flux materials. TSvet. met. 38 no.139-15  
Ja '65 (MIRA 18:2)

ACHVASOVA, I.O.; GAIKINA, A.G.; YEFREMOV, I.I.; SMAKHINA, Yu.B.; KOMISSAROVA,  
M.T.; SOVETOVA, I.Ye.; CHISTIKOVA, A.I.; SHAKHOVA, A.N.

Effectiveness of ambulatory treatment of cholelithiasis patients  
at Zheleznovodsk Health Resort. Sbor. nauch. rab. vrach. san.-kur.  
uchr. profsoyuzov no.1:121-125 '64.

(MIRA 18:10)

1. Zheleznodorozhnaya kurortnaya poliklinika (glavnyy vrach I.I.  
Yefremov).



LEBEDEVA, Ye.K.; MELESHKO, G.I.; SHAKHOVA, A.N.

Mineral nutrition requirements by Chlorella cells in an intensive  
culture. Probl. kosm. biol. 4:687-693 '65. (MIRA 18:9)

L 14254-66 EWT(1)/FS(v)-3 SCID DD/RD

ACC NR: AT6003909

SOURCE CODE: UR/2865/65/004/000/0687/0693 48

AUTHOR: Lebedeva, Ye. K.; Meleshko, G. I.; Shakhova, A. N.

ORG: none

TITLE: Utilization of elements of mineral nutrition by Chlorella cells in intensive cultivation 2

SOURCE: AN SSSR. Otdeleniye biologicheskikh nauk. Problemy kosmicheskoy biologii, v. 4, 1965, 687-693

TOPIC TAGS: Chlorella, mineral, acid base equilibrium, plant growth, chemical composition, solution concentration

ABSTRACT: Experiments were performed to determine the mineral-salt requirements of a thermophylic strain of Chlorella pyrenoidosa S-39 in order to calculate the additions to the medium required during prolonged intensive culture. The cultures were grown in a Tamiya medium containing the following amounts of mineral salts per liter: 5 g  $\text{KNO}_3$ , 2.5 g  $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$ , 1.25 g  $\text{KH}_2\text{PO}_4$ , 1.2 mg  $\text{Fe}^{+2}$ , and microelements as prescribed by Arnon. The Chlorella was cultured in a closed-air cultivator which contained

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ACC NR: AT6003909

3—5% CO<sub>2</sub>. A temperature of 39—40° C was maintained, and the suspension was illuminated around the clock.

When Chlorella was cultivated without additional corrections to the medium, the pH shifted from 6.6 to 8.8 or even to 9.0. However this did not affect the rate of growth, which was from 0.5—0.6 billion cells per ml per diem. In a number of experiments the pH was corrected by means of nitric acid so that it remained between 6 and 7, thus preventing magnesium and phosphorus from precipitating out as more or less insoluble salts. During the process of cultivation concentrations of elements varied within the following limits: nitrogen, 0.70—0.05 g/liter; phosphorus, 0.30—0.10 g/liter; sulfur, 0.32—0.22 g/liter; calcium, 2.3—2.15 g/liter; magnesium, 0.24—0.18 g/liter; and iron, 0.0012—0.0001 g/liter. The elements composing the biomass of Chlorella obtained in various experiments are shown in Table 1.

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ACC NR: AT6003909

Table 1. Chemical elements composing the biomass of *Chlorella* (in % of dry weight)

No. of experiment	N	P	S	K	Mg	Fe
1	7.87	1.80	1.07	1.50	0.68	0.01
2	7.70	1.80	1.18	1.68	0.48	0.03
3	8.20	1.70	1.06	1.60	0.55	0.02
4	8.20	1.65	—	1.63	0.48	0.05
5	—	1.76	1.19	—	—	—
Average	8.00±0.21	1.74±0.05	1.12±0.06	1.60±0.05	0.57±0.08	0.03±0.01

As Table 1 shows, the amounts of nitrogen, phosphorus, sulfur, and calcium remain relatively stable, deviating within a limit of 7%. The magnesium content was relatively stable, although it sometimes deviated by as much as 20%. The most variable element was iron. The data obtained on the chemical composition of *Chlorella* grown in Tamiya medium made it possible to estimate the amount of corrective additions to the medium necessary.

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ACC NR: AT6003909

ecessary for prolonged cultivation of *Chlorella pyrenoidosa* S-39. The amount of nitrogen removed from the medium and its accumulation in the composition of the biomass of *Chlorella* is shown in Table 2.

Table 2. Removal of nitrogen from Tamiy<sub>2</sub> medium and its accumulation in the biomass of *Chlorella*

No. of experiment	Dry wt of 100 million cells in g	Removal of nitrogen from the medium, in mg		Content of nitrogen in biomass	
		per 100 million cells	per gram of dry weight	per gram of dry weight	% of amt. removed
1	0.76	0.060	81.0	78.8	97
2	0.66	0.057	86.0	84.0	98
3	0.73	0.057	78.0	78.0	100
4	0.80	0.066	82.5	78.1	94.5
5	0.73	0.060	82.5	77.0	93.3
Average	0.73 ± 0.03	0.061 ± 0.004	82.0 ± 1.9	79.1 ± 1.9	96.5 ± 2.1

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L 14254-66

ACC NR: AT6003909

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Table 3. Removal of magnesium and phosphorus from Tamiye medium

No. of experiment	magnesium	phosphorus	magnesium	phosphorus
	mg per 100 million cells		mg per 1 g of dry weight	
1	0.0039	0.0140	4.90	17.80
2	0.0054	0.0156	7.35	21.00
3	0.0018	0.0104	6.55	14.20
4	0.0050	0.0121	6.95	16.50
5	0.0030	0.0094	4.05	12.40
6	0.0050	0.0126	6.40	17.30
7	0.0030	0.0149	6.05	18.40
8	0.0050	—	6.80	—
9	—	0.0150	—	17.90
Average	0.0044 ± 0.0008	0.013 ± 0.0016	5.75 ± 1.20	17.60 ± 1.70

Card 5/8

L 14254-66

ACC NR: AT6003909

A comparison of the amounts of nitrogen removed from the medium and its accumulation in the biomass indicate that the difference between the two is very small, varying from 3.5 to 7%. Table 3 shows the amounts of magnesium and phosphorus removed from the medium.

A removal of magnesium in different experiments is quite unstable and varies by as much as 23% from the average amount; the removal of phosphorus is much more stable.

Table 4 shows the absolute amounts of microelements of mineral nutrition which must be added to the solution for correcting the medium during the cultivation of *Chlorella pyrenoidosa* S-39, as well as molar and weight relationships between these elements. Table 4 also shows that *Chlorella* requires a comparatively large amount of nitrogen.

Card 6/8

L 14254-66

ACC NR: AT6003909

Table 4. Amount of elements of mineral nutrition added to the nutrient medium calculated for an increase of 1 g of biomass

element	Amount of elements		Relative value	
	mg/g	mg (mg-atom/g)	weight relation	molar relation
Nitrogen	82.0	5.85	1	1
Phosphorus	17.4	0.56	0.242	0.095
Sulphur	11.2	0.35	0.136	0.060
Calcium	16.9	0.42	0.105	0.072
Magnesium	5.7	0.24	0.070	0.041
Iron	0.3	0.0056	0.0037	0.001

Table 5 shows the absolute amounts of compounds which must be added to the neutral medium in order to correct it for the proper concentration of elements and the pH.

Card 7/8



L 14254-66

ACC NR: AT6003909

Table 5. Absolute amounts of acid and salts added to the nutrient medium calculated for an increase of 1 g of biomass

Compound	m mol	g	Compound	m mol	g
HNO <sub>3</sub>	5.85	0.300	MgSO <sub>4</sub> ·7H <sub>2</sub> O	0.24	0.059
KH <sub>2</sub> PO <sub>4</sub>	0.42	0.057	H <sub>2</sub> SO <sub>4</sub>	0.11	0.010
HP <sub>3</sub> O <sub>4</sub>	0.12	0.011	FeSO <sub>4</sub> ·7H <sub>2</sub> O	0.0056	0.0015

On the basis of data presented in Table 5 it is possible to calculate the composition of solutions required for prolonged intensive cultivation of *Chlorella pyrenoidosa* S-39 so that optimal concentrations of macroelements of the mineral nutrition will be maintained. / Orig. art. has 5 tables.

/ATD PRESS: 4091-F7

FW  
Card 8/8

LUSHCHITSKIY, V.O., dotsent; SHAKHOVA, F.B., kand.med.nauk

Clinical aspects and early diagnosis of Paget's disease of the breast. Vest. dermat. i ven. no.5:16-20 '65. (MIRA 18:11)

1. Ukrainskiy institut usovershenstvovaniya vrachey i Ukrainskiy nauchno-issledovatel'skiy kozhno-venerologicheskii institut (direktor - dotsent A.I.Pyatikop), Khar'kov. Submitted February 17, 1964.

Shakhova, F.B.

USSR / Virology--Viruses of Man and Animals; Newly-Discovered and Little-Studied Viruses  
 Abs Jour: Raf Zhur-Biologiya, No 21, 1959, 94917  
 Author : Krivonozkiy, A. M., Mikhaylova, P. V., Bogdanova, M. G., Ratina, S. N., Shakhova, F. B.  
 Inst : Karlov Scientific Medical Society  
 Title : Further Results of the Study of the Virus Etiology of Psoriasis, Pemphigus, Dühring's Dermatitis (Borpetiformis) and Lupus Erythematosus  
 Orig Pub: Zh. Karlovsk. nauchn. sed. o-vo, 1957, v. 9, pp. 9, 31-38

Abstract: Chicken embryos (CE) (7 days old) were infected in the allantoic cavity with suspensions of patients with psoriasis, with serum or liquid of the bladder

Card 1/3

22

from patients with pemphigus and Dühring's dermatitis, and then incubated at 26 to 28 degrees. There was observed an accumulation of antigens in the allantoic liquid of the infected CE on the fourth day; in CE infected with psoriasis, a weak accumulation was noted, in addition, of elementary bodies. During passing (4 passages), the antigenic properties of allantoic liquid decreased. Direct and crossed experiments of CFR (complement fixation reaction) with antigens and serum of patients paraffinized the establishment of a group proximity of antigens of the group of diseases studied. In serum of healthy appearing members of families in which psoriasis was observed, specific complement fixation antibodies were found and an antigen,

Card 2/3

and serum, and complement fixation, in the serum of patients

confirms the presence of a virus carrier and of hidden forms of psoriasis. -- I. A. Shumeykina

Card 3/3

23

SHAKHOVA, F. B., Cand Med Sci -- "Clinic of the Reiter's syndrome in women. Certain data for the etiology of the disease." Khar'kov, 1961. (Khar'kov State Med Inst) (KL, 8-61, 266)

- 544 -

LUSHCHITSKIY, V.O. (Khar'kov, ulitsa Danilevskogo dom 8, kvartira 44);  
PROSKURINA, V.S. (Khar'kov, ulitsa Danilevskogo, dom 8, kv. 44);  
SHAKHOVA, F.B. (Khar'kov, ulitsa Danilevskogo, dom 8, kvartira  
44)

Ten years of experience with electrosurgical treatment of pre-  
tumorous skin diseases. Vop. onk. 9 no.8:94-98 '63 (MIRA 17:4)

1. Iz Ukrainskogo instituta usovershenstvovaniya vrachey  
(rektor I.I. Ovsiyenko) i Ukrainskogo nauchno-issledovatel'-  
skogo kozhno-venerologicheskogo instituta (direktor - dotsent  
A.I. Pyatikop).

MATOUSHEK, Iozef [Matousek, Josef]; CHUTA, Ya. [Cuta, J.] tekhnicheskiiy sotrudnik; GLAZROVA, Z. [Glasrova, Z.], tekhnicheskiiy sotrudnik; GORZHAKOVA, I. [Horzakova, I.], tekhnicheskiiy sotrudnik; MATOUSHKOVA, V. [Matouskova, V.]; tekhnicheskiiy sotrudnik; SACHKOVA, G. [Sachova, G.], tekhnicheskiiy sotrudnik

Preparation of immune serums for determining the group antigens in the blood of red and white cattle. Zhur. ob. biol. 24  
no.1:50-63 Ja-F'63 (MIRA 16:11)

1. Laboratoriya biologii razmnozheniya sel'skokhozyaystvennykh zhivotnykh Chekhoslovatskaya akademiya sel'skokhozyaystvennykh nauk, Iubekhov, Chekhoslovatskaya Sotsialisticheskaya Republika.

CHAPLYGIN, B.K.; SHAKHOVA, G.I.

Use of translucent films for the growing of green cuttings  
of ornamental shrubs. Biul. Glav. bot. sada no.55:56-65 '64.  
(MIRA 18:11)

1. Glavnyy botanicheskiy sad AN SSSR.

SHAKHOVA, I.K.

Boron biogeochemical province in northwestern Kazakhstan. Trudy  
Biogekhim. lab. no.11:232-237 '60. (MIRA 14:5)

1. Institut geokhimii i analiticheskoy khimii imeni V.I.Vernadskogo  
AN SSSR.

(KAZAKHSTAN--SOILS--BORON CONTENT)  
(BORON--PHYSIOLOGICAL EFFECT)



SHAKHOVA, I.K.

Distribution of boron in brain and liver tissue fractions. Biokhimiia  
26 no.2:315-318 Mr-Apr '61. (MIRA 14:5)

1. Institute of Geochemistry and Analytical Chemistry, Academy of  
Sciences of the U.S.S.R., Moscow.  
(BRAIN) (LIVER) (BORON IN THE BODY)

SHAKHOVA, I. K.

Card Biol Sci - (diss) "Biogeochemical province enriched with boron."  
Moscow, 1961. 22 pp; (Moscow Order of Lenin and Order of Labor  
Red Banner State Univ imeni M. V. Lomonosov); 200 copies; price  
not given; (KL, 10-61 sup, 211)

KOVAL'SKIY, V.V.; SHAKHOVA, I.K.

Activity of the digestive enzymes of sheep under conditions  
of a biogeochemical boron province in northwestern Kazakhstan.  
Dokl. AN SSSR 146 no.4:967-970 0 '62. (MIRA 15:11)

1. Institut geokhimii i analiticheskoy khimii im.  
V.I. Vernadskogo AN SSSR. Predstavleno akademikom  
A.I. Oparinym.

(Kazakhstan--Sheep--Physiology)  
(Boron--Physiological effect)  
(Digestive enzymes)

SHAKHOVA, I.K. (Moskva)

Origin of mutations and metabolism. Usp. sovr. biol. 60 no.1:  
76-89 J1-Ag '65. (MIRA 18:8)

68234

5(2) 18.1250

S/078/60/005/02/028/045  
B004/B006

AUTHORS: Budberg, P. B., Shakhova, K. I.

TITLE: Properties of the Alloys of the Ternary System Nickel-  
Chromium<sup>1</sup>- Tungsten<sup>2</sup>

PERIODICAL: Zhurnal neorganicheskoy khimii, 1960, Vol 5, Nr 2, pp 415-420  
(USSR)

ABSTRACT: The authors investigated the electrical resistivity, hardness, and heat hardness after various heat treatments, of 32 alloys of the system Ni - Cr - W containing 5, 10, 20, and 30% W and 2, 5, 10, 15, 20, 25, 30, and 35% Cr. The alloys were smelted in a high-frequency furnace under a layer of basic slag. Thus, an oxidizing loss of Cr and W was avoided, as is shown by the analyses (Table 1). The test samples were partly annealed for 24 hr. at 1200°C, and partly for 100 hr. at 1000°C. Then the one series was hardened, and the other annealed another 100 hr. at 800°C. The specific electric resistivity and its temperature coefficient were measured at 20 and 100°C (Table 2, Figs 1-3). The resistivity in hardened alloys has its peak value at 5% W and 35% Cr. In annealed alloys this peak is shifted to lower Cr contents. These data confirm the changing.

Card 1/2

68234

Properties of the Alloys of the Ternary System  
Nickel - Chromium - Tungsten

S/078/60/005/02/028/045  
B004/B006

solubility of Cr and W in the ternary solid Ni-solution. The hardness of the alloys was determined by means of an apparatus type TP (Table 3). An increasing Cr-content in the solid Ni solution leads to a continuous increase in hardness. Alloys with varying Cr- and Ni-contents are compared in table 4. An increasing W-content causes a sharper increase in the hardness of the alloys than an equal increase of the Cr-content. Heat hardness was measured between 100 and 1000° at intervals of 100° by means of the VIM-1 apparatus (designer M. G. Lozinskiy) (Table 5, Fig 4). At constant W-contents and increasing Cr-contents hardness decreases with increasing temperature. Table 6 shows the change in heat hardness of an alloy containing 25% Cr and varying W-content. Under these conditions the alloys are more strengthened by W than by Cr. There are 4 figures, 6 tables, and 1 Soviet reference.

ASSOCIATION: Institut metallurgii im. A. A. Baykova Akademii nauk SSSR  
(Institute of Metallurgy imeni A. A. Baykov of the Academy of Sciences, USSR)

SUBMITTED: October 9, 1958  
Card 2/2

28869

S/180/61/000/004/007/020

ESU/ESU

18 1285

AUTHORS: Shchegolev, E. A. (P. G. (Moscow))  
 TITLE: Investigation of the properties of the Ti-Nb system  
 PERIODICAL: Arkhiv Khim. i Mekh. (1961, No. 4, 1961, 1, 2, 3, 4)  
Usp. Khim. (1961, No. 4, 1961, 1, 2, 3, 4)

TEXT: The present work deals with an investigation of the properties of the Ti-Nb system and had the object of improving the accuracy of the phase diagram of the Ti-Nb system in the range of 400-1000°K. Alloys were arc-melted in a cooled copper mould, with a consumable tungsten electrode, under an argon atmosphere. Grade TFCO (FG-00) 99.92% pure electrothermic titanium (impurities 0.15% Fe, 0.05% Si, 0.05% C, 0.06% Mg, 0.10% O<sub>2</sub>, 0.01% H<sub>2</sub>, 0.03% N<sub>2</sub>, 0.03% Ni) and 99.27% pure niobium (impurities 0.9% Ta, 0.09% Ti, 0.05% Fe, 0.09% Si, 0.05% C, B < 5 x 10<sup>-5</sup>) were used. Alloys were annealed in double quartz capsules at 1500°C for 6 hours at a pressure of 10<sup>-4</sup> mm Hg. Two parallel batches of alloys were then annealed

28869

S/180/61/000/004/007/020  
ELL1/E360

Investigation of ...

at 1 100 °C for 50 hours and at 1 000 °C for 100 hours. One batch was water-quenched, the other slowly cooled to room temperature. The eight alloys prepared had the following Ti contents (weight %): 2.0, 2.18, 24.3, 25.3, 26.3, 53.0, 55.0 and 60.0. Microstructures, hardness and X-ray patterns (copper electrode, nickel filter) were studied. All the alloys were solid solutions. No metallic compound of the type TiNb was found, the second phase previously reported (Ref. 3 - V.P. Yelyutin, M.L. Berinshteyn and Ye.A. Pavlov - Dokl. Ak. nauk, SSSR, 1955, v. 104, no. 4) being, as shown by special experiments with Ti-Nb alloys containing up to 0.3% C, a solid solution of titanium and niobium carbides. There are 2 figures, 2 tables and 4 Soviet-Rus references.

SUBMITTED: N. 13. 1960

Card 2/2



18.1200

2953h  
S/078/61/006/011/012/013  
B101/B147

AUTHORS: Alisova, S. P., Budberg, P. B., Shakhova, K. I.

TITLE: Phase diagram of the quaternary system nickel - chromium - tungsten - aluminum at 1100°C

PERIODICAL: Zhurnal neorganicheskoy khimii, v. 6, no. 11, 1961, 2607-2609

TEXT: Part of the system Ni - Cr - W - Al (up to 40 % of Cr and 30 % of W + Al), and the properties of these alloys were studied in the present paper. Three tetrahedral sections of the system were examined. Ratios: W : Al = 3 : 1 (I); 1 : 1 (II); and 1 : 3 (III). The alloys were molten from electrolytic Ni, Cr, W, and A-000 (A-000) aluminum. Al was introduced into the melt as NiAl (29 % of Al). The alloys were subjected to various kinds of heat treatment. For 50 hr they were kept at 1100°C, then the first sample was chilled whereas the others were kept at 1000°C for another 100 hr. Then, the second sample was chilled, samples 3 and 4 were kept at 800°C for 250 hr. Sample 3 was chilled and sample 4 cooled down to room temperature within 24 hr. Since homogeneity was not attained homogenizing annealing followed at 1300-1350°C in a TBB-2M (TVV-2M)

Card 1/2

Phase diagram of the quaternary...

2953h  
5/078/61/006/011/012/013  
B101/B147

Furnace. The diagrams of Fig. 2 were plotted for the three sections on the basis of their microstructures and powder patterns. An X-ray analysis of the quaternary solid nickel solution of section I showed that an increase of the Cr content from 10 to 40 % increased the lattice constants of the solid solution from 3.55 to 3.62 kX; an increase of the total W + Al content from 10 to 40 % at a constant Cr content changed the lattice constant from 3.55 to 3.56 - 3.57 kX. The thermal resistivity of the alloys was tested by a method involving centrifuging at 850-900°C and 10-15 kg/mm<sup>2</sup>. At 900°C and under a load of 10 kg/mm<sup>2</sup>, the alloy with 10 % of Cr, 22.5 % of W and 7.5 % of Al showed a 4 mm deformation after 160 hr. The alloy containing 10 % of Cr, 15 % of W and 5 % of Al underwent 6 mm deformation under the same conditions. The thermal resistivity was tested at 1100°C. Considerable softening of all alloys occurred between 700 and 800°C. With increased Al content it was shifted toward higher temperatures. There are 2 figures, 1 table, and 3 references: 2 Soviet and 1 non-Soviet. The reference to the English-language publication reads as follows: A. Taylor, R. W. Floyd, J. Inst. Metals, 81, 451 (1952/53).

SUBMITTED March 20, 1961

Card 2/2

ALISOVA, S.P.; BUDBERG, P.B.; SHAKHOVA, K.I.

Phase diagram of the quaternary system nickel - chromium -  
tungsten - aluminum at 1100 . Zhur. neorg. khim. 6 no. 11:2607-2609  
'61. (MIRA 14:10)

(Systems (Chemistry)) (Alloys)

S/598/62/000/007/009/040  
D267/D307

AUTHORS: Shakhova, K. I. and Budberg, P. B.

TITLE: Investigating alloys of the system titanium-niobium

SOURCE: Akademiya nauk SSSR. Institut metallurgii. Titan i yego  
splavy. no. 7, Moscow, 1962. Metallokhimiya i novyye  
splavy, 78-80

TEXT: This research was carried out for the purpose of obtaining a more exact phase diagram of the system Ti-Nb in the concentration interval between 40 and 90% nb. The alloys were melted in an arc furnace with W electrodes, in an argon atmosphere, with subsequent heat treatment. Regardless of the kind of heat treatment all alloys were homogeneous solid solutions. The curve of the lattice period variation for the  $\beta$ -solid solutions of the system Ti-Nb has negative deviations from Vegard's law. No intermetallic compound of the TiNb type could be observed. There are 4 figures and 1 table. ✓

Card 1/1

S/659/62/008/000/010/028  
I048/I248

AUTHORS: Alisova, S.P., Budberg, P.B., and Shakhova, K.I.

TITLE: Investigation of alloys of the quaternary system nickel-chromium-tungsten-aluminium

SOURCE: Akademiya nauk SSSR. Institut metallurgii, Issledovaniya po zharoprochnym splavam. v.8. 1962. 74-78

TEXT: Isothermal sections (1100°C) representing Ni-Cr-W-Al alloys with fixed W:Al wt. ratios (3:1, 1:1, 1:3) were prepared on the basis of x-ray, microstructural, and chemical analyses of the quaternary alloys containing up to 50% Cr and up to 50% W+Al. The  $\gamma$ -phase (Ni-based solid solution) is predominant in the alloys with a 3:1 W:Al ratio; a three-phase region ( $\gamma + \beta + \alpha_2$ ) exists in the alloys containing over 40% W+Al,  $\beta$  being a NiAl-based and  $\alpha_2$  a W-based solid solution. The alloys with a 1:1 W:Al ratio are characterized by a narrower  $\gamma$  region and by three 3-phase regions:  $\gamma + \beta + \alpha_2$ ,  $\gamma + \gamma' + \alpha_2$ , and  $\gamma + \gamma' + \beta$ ,  $\alpha$  being a Cr-based and  $\gamma'$  a Ni<sub>3</sub>Al-based solid solution. Alloys with a 1:3 W:Al ratio are

Card 1/2

S/659/62/008/000/010/028  
I048/I248

# Investigation of alloys...

characterized by an even narrower  $\gamma$  -region and by the appearance of homogenous  $\gamma'$  and  $\delta$  regions. The lattice parameter of the  $\gamma$  -phase in the 3:1 W:Al alloys increases with the Cr content, from 3.55 kX at 10% Cr to 3.62 kX at 40%Cr; variations in the W+Al content have a negligible effect on this parameter. The solubility of W+Al in the  $\gamma$  -phase is 35, 15, and 10% in the 3:1, 1:1, and 1:3 W:Al alloys respectively. Many alloys within the systems studied exhibited fair refractory properties when subjected to centrifugal tests at 850-900°C; alloys with increased Al content retain their hardness at even higher temperatures. There are 4 figures and 1 table.

Card 2/2

SHAKHOVA, K. I. (Moskva); BUDBERG, P. B. (Moskva)

Constitutional diagram of the system titanium-niobium-chromium.  
Izv. AN SSSR. Otd. tekhn. nauk. Met. i topl. no.6:137-141  
N-D '62. (MIRA 16:1)

(Titanium-niobium-chromium alloys—Metallography)  
(Phase rule and equilibrium)

SHAKHOVA, K.I.

AID Nr. 995-10 21 June

TiCr<sub>2</sub>-NbCr<sub>2</sub> SYSTEM (USSR)

Kornilov, I. I., K. I. Shakhova, P. B. Budberg, and N. A. Nedumov. IN:  
Akademiya nauk SSSR. Doklady, v. 149, no. 6, 21 Apr 1963, 1340-1342.  
S/020/63/149/006/017/027

Ten TiCr<sub>2</sub>-NbCr<sub>2</sub> alloys with 0 to 100% TiCr<sub>2</sub> have been studied at the Institute of Metallurgy imeni A. A. Baykov, Academy of Sciences USSR. From

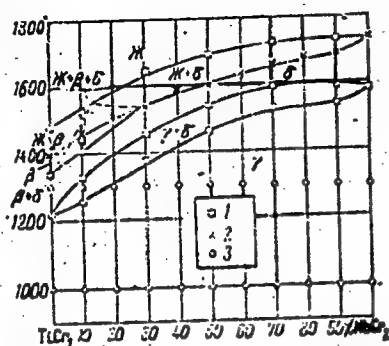
Card 1/3



AID Nr. 995-10 21 June

TiCr<sub>2</sub>-NbCr<sub>2</sub> SYSTEM [Cont'd]

s/020/63/149/006/017/027



the results of the thermal and x-ray diffraction analyses, the phase diagram (see illustration) of the system was plotted. Over the entire concentration range, TiCr<sub>2</sub> and NbCr<sub>2</sub> form a continuous series of solid solutions not only between the high-temperature modifications  $\delta$  but also between the low-temperature modifications  $\gamma$ . The  $\gamma$ - $\delta$  transformation temperatures for TiCr<sub>2</sub> and NbCr<sub>2</sub> were determined as  $1220 \pm 10^\circ\text{C}$  and  $1585 \pm 10^\circ\text{C}$ , respectively. On the TiCr<sub>2</sub> side the  $\beta$ ,  $\beta + \delta$ ,  $\beta + L$ , and  $\beta + \delta + L$  regions are present, since the TiCr<sub>2</sub> compound in the binary Ti-Cr system is formed from a solid solution with a bcc lattice (the  $\beta$ -phase). X-ray diffraction patterns of alloys quenched from  $1300^\circ\text{C}$  showed that at

this temperature the TiCr<sub>2</sub> compound is a hexagonal  $\delta$ -phase; the 90%

Card 2/3

AID Nr. 995-10 21 June

 $\text{TiCr}_2$ - $\text{NbCr}_2$  SYSTEM [Cont'd]

8/020/63/149/006/017/027

$\text{TiCr}_2$  + 10%  $\text{NbCr}_2$  alloy consists of hexagonal  $\delta$  and cubic  $\gamma$  modifications. Alloys with more than 20%  $\text{NbCr}_2$ , as well as the  $\text{NbCr}_2$  compound, consist only of the cubic  $\gamma$ -phase. In alloys annealed at 1000°C for 200 hrs, only the  $\gamma$ -phase was found. Thus, the  $\text{TiCr}_2$ - $\text{NbCr}_2$  system can be regarded as a quasi-binary section of the ternary Ti-Nb-Cr system up to 1340°C, when decomposition of the  $\text{TiCr}_2$  compound to a solid solution of Ti and Cr occurs.

IMS1

Card 3/3

SHARHOVA, K.I. (Moskva); BUDBERG, P.B. (Moskva)

Solidus surface of the system Titanium - Niobium - Chromium. Izv.  
AN SSSR. Otd. tekhn. nauk. Mat. i gor. delo no.4:159-160. JI-Ag '63.

ACCESSION NR: AT4007025

8/2598/63/000/010/0037/0041

AUTHOR: Shakhova, K.I.; Budberg, P. B.

TITLE: Investigation of ternary titanium-niobium-chromium alloys

SOURCE: AN SSSR. Institut metallurgii. Titan i yego splavy\*, no. 10, 1963.  
Issledovaniya titanovy\*kh splavov, 37-41

TOPIC TAGS: titanium ternary alloy, titanium chromium niobium alloy, titanium alloy,  
alloy structure, titanium chromium niobium system

ABSTRACT: The cross sections of the ternary system Ti-Nb-Cr corresponding to Ti:  
Nb= 4:1, 3:2, 2:3 and 1:4, as well as the compounds  $TiCr_2$ - $NbCr_2$ , have been studied by  
means of microstructure analysis and X-ray diffraction. The specimens were annealed in  
argon at temperatures of 1300-1500 C for 60-70 hours (alloys rich in Ti) and up to 240  
hours (alloys rich in Nb and Cr). The specimens were then hardened at 1000, 800, and  
600 C. The microstructures as determined by the common etching methods are shown in  
the original. On the basis of the X-ray and microstructure data, isothermic cross sections  
in alloys hardened at 1000, 800, and 600 C were constructed and are shown in Figure 1  
of the Enclosure. The basic area of the figure for alloys hardened at 1000 C consists of a  
mixture of the  $\beta$  and  $\gamma$  solid solutions,  $\gamma$  representing the solid solution of the compounds

Card

1/3

ACCESSION NR: AT4007025

(TiNb)Cr<sub>2</sub>. The area of the  $\beta$  solid solution is gradually reduced as the content of Nb in the alloys is increased. The phase distribution in the isothermic cross section at a hardening temperature of 800 C did not differ from the isothermic cross section at 1000 C, except that a biphasic area of  $\alpha + \beta$  phases was found in the Ti corner. In the 600 C cross section of the ternary system, a large area of  $\alpha + \beta + \gamma$  phases is formed which borders on the biphasic areas  $\alpha + \beta$ ,  $\alpha + \gamma$ , and  $\beta + \gamma$ . Monophasic alloys exist only in the area with Nb content above 50%. The changes in lattice periods corresponding to the individual phases are also shown. Orig. art. has: 5 figures.

ASSOCIATION: Institut metallurgii AN SSSR (Institute of Metallurgy, AN SSSR)

SUBMITTED: 00

DATE ACQ: 27Dec63

ENCL: 01

SUB CODE: ML

NO REF SOV: 003

OTHER: 002

Card

KORNILOV, I.I.; SHAKHOVA, K.I.; BUDBERG, P.B.; NEDUMOV, N.A.

Phase diagram of  $TiCr_2$  -  $NbCr_2$ . Dokl. AN SSSR 149 no.6:1340-1342  
Ap '63. (MIRA 16:7)

1. Institut metallurgii im. A.A.Baykova. Predstavleno akademikom  
I.I.Chernyayevym.

(Titanium-niobium-chromium alloys)  
(Phase rule and equilibrium)

L 15670-65 EWT(m)/EPF(n)-2/EWP(t)/EWP(h) Pu-4 ASD-3/AFPTC/ESD-3/SSD/LJP(c)  
 ACCESSION NR: AT4048069 JD/JG/MLK S/0000/64/000/000/0184/0189

AUTHOR: Shakhova, K. I.; Budberg, P. B.

TITLE: Stability of the interatomic bond of monophasic alloys of the Ti-Nb-Cr<sup>B71</sup>  
 system

SOURCE: Soveshchaniye po metallurgii, metallovedeniyu i primeneniyu titana i vego  
splavo/, 5th, Moscow, 1963. Metallovedeniye titana (Metallography of titanium);  
trudy\* soveshchaniya. Moscow, Izd-vo Nauka, 1964, 184-189

TOPIC TAGS: titanium alloy interatomic bond, titanium alloy stability, interatom-  
ic bond stability, monophasic alloy, niobium containing alloy, chromium containing  
alloy, alloy crystal structure 18 27

ABSTRACT: The stability of the interatomic bond in the crystal lattice of metals and alloys is characterized by the heats of sublimation, melting and dissolution, elasticity constants, the mean distribution of atoms in the lattice and other parameters. The present paper investigates the forces of interatomic bonding in monophasic Ti-Nb-Cr alloys. The elasticity constants of the  $\beta$  and  $\gamma$  alloys were determined on the "Elastomat" unit with an accuracy of 1-1.5% after quenching from 1000C with Ti:Nb = 4:1, 3:2, 2:3 or 1:4. All alloys with 50% Cr, where the  $\gamma$ -phase is predominant, show a modulus of normal elasticity of the solid solution

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which is much higher than for the pure components of the  $\beta$ -phase. The values of the mean distribution of atoms were calculated by the Debye-Waller equation. The tests showed that niobium has less of an effect on the forces of interatomic bonding than chromium. Chromium is very important for increasing the strength as the temperature rises. The tests also indicated that increasing the niobium content in the  $\chi$ -solid solution leads to proportional increases in the characteristic temperature and bonding strength in the  $\chi$ -phase lattice. These conclusions were verified by tests at high temperatures. By analyzing the data on the variation in hot strength of the alloys it can be seen that monophasic  $\beta$ -solid solutions are weakened more rapidly than  $\chi$ -phase alloys. The results also corroborate previous conclusions from the analysis of atomic distribution at 0 and 293K. Although chromium is most effective for hardening  $\beta$ -solid solutions, niobium is important for hardening the  $\chi$ -phase. "S. G. Fedotov assisted in the determination of the elastic constants." Orig. art. has: 3 figures, 5 formulas and 3 tables.

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